Work Zone “Variable” Speed Limits

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Work Zone “Variable” Speed Limits

Fundamental question is….do we want a speed limit reduction?.....OR…do we want drivers to slow down through the work zone?

Work Zone “Variable” Speed Limits

- **Not in the Traffic Engineering Branch’s TEPPL…..yet**
- **Still in the “trial usage” phase**
- **Obtaining the performance results through the Safety Evaluation Group**
- **Applications- Portable Changeable Message Signs and Portable Speed Reduction Signs**

Work Zone "Variable" Speed Limits

Purpose- Reduce Speed Limits in work zones for short periods of time (not to exceed 30 days) and only when lanes are closed and work is taking place

Goal- Improve Worker Safety by reducing speeds during "passive" lane closures (ie cones/drums)

Targetted Projects- Any interstate resurfacing/rehabilitation where queueing isn't expected. (Lower volumes or Night work)

Desired Outcome- Obtain Voluntary Compliance with established work zone speed limit

Engineering Standard for Posting Speed Limits on Portable Changeable Message Signs

MUTCD 2003 Section 2B.13 – Speed Limits

"A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is shown at the proper times."

Enforceable?

"§ 136-33.2A. Signs marking beginning of reduced speed zones.

If a need to reduce speed in a speed zone is determined to exist by an engineer of the Department, there shall be a sign erected, of adequate size, at least 600 feet in advance of the beginning of any speed zone established by any agency of the State authorized to establish the same, which shall indicate a change in the speed limit.“

Enforceable?

§ 20-141. Speed restrictions. (j2)

A person who drives a motor vehicle in a highway work zone at a speed greater than the speed limit set and posted under this section shall be required to pay a penalty of two hundred fifty dollars ($250.00).

Work Zone “Variable” Speed Limits

Enforceable? **§ 20-141. Speed restrictions. (j2)** A law enforcement officer issuing a citation for a violation of this section while in a highway work zone shall indicate the vehicle speed and speed limit posted in the work zone

Work Zone “Variable” Speed Limits

Effective?.....anyone slowing down?.....well you really don’t know until it’s measured

An Evaluation of Using Portable Changeable Message Signs (PCMS) To Regulate Speed Limit in the I-95 Workzone Northampton County Project # I-4913

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Safety Evaluation Group

NCDOT Traffic Engineering

Project Scope

The goal of this project is as follows:

Determine if temporary speed limits posted on a PCMS in workzones are effective in creating speed limit compliance.

Engineering Standard for Posting Speed Limits on Portable Changeable Message Signs:

"A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided that the appropriate speed limit is shown at the proper times."

MUTCD 2003 Section 2B.13

Measures of Effectiveness

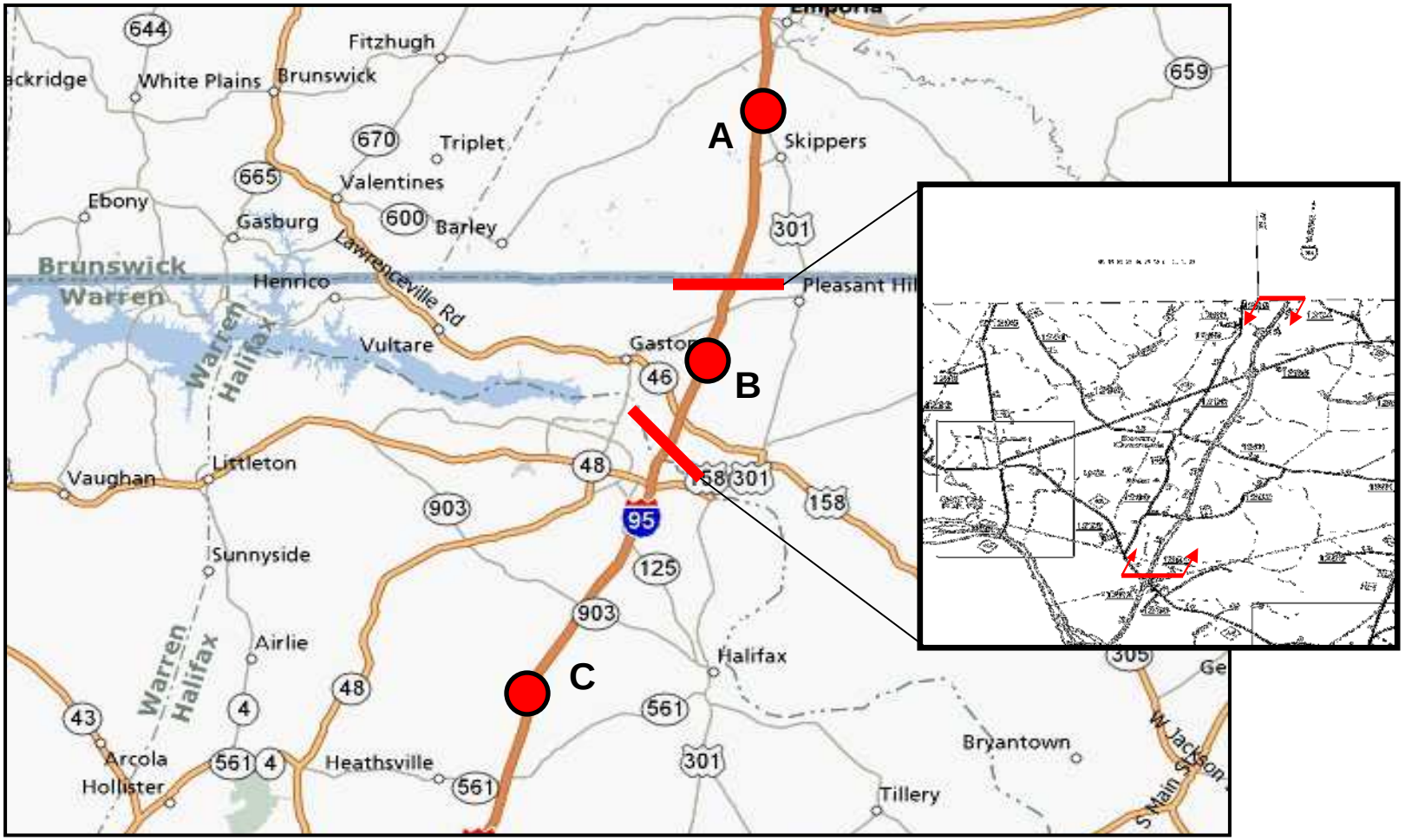
- **Vehicle Speeds**
  speed chosen by the lead driver and collected using the Lidar Gun

- **Average Speed**
  speeds collected per location and direction averaged

- **Percentage of Vehicles Exceeding Speed Limit**
  calculated and graphed results showing “Number of Vehicles” vs. “Observed Speed minus Speed Limit”

- **Pace Speed**
  set of 10 miles per hour where the largest percentage of speeds fall per data set

Data Points



A. Upstream Location – Greensville County, Virginia: VA 639 (Rock Bridge Rd)
B. Study Location – Northampton County, North Carolina: SR 1202 (Blythe Rd)
C. Downstream Location – Halifax County, North Carolina: SR 1001 (Justice Branch Rd)

Data Collection

i. Speeds collected with Lidar Gun – conducted accuracy test

ii. Data was collected Monday – Saturday during daytime hours (9am – 3pm) @ 1 hr increments

iii. Collect Before, After, Upstream During, and Downstream During from atop bridges with no access ramps to I-95 – inconspicuous spot (not to influence behavior)

iv. Only targeted unimpeded vehicles for speed (free-flow conditions) – no platoon vehicle speeds

v. Speeds collected under similar weather conditions – clear to overcast skies and dry roadway

vi. In the Workzone – speeds collected from shoulder within lane closure

Southbound

Northbound

Workzone Approach Warning

Workzone: single lane closure, one direction, daytime hours 8am – 7pm

1. ROAD WORK AHEAD / BE PREPARED TO STOP (Virginia Exit 4)
2. WORKERS IN ROADWAY / REDUCE SPEED AHEAD (Virginia MM 2)
3. WORKERS IN ROADWAY / MERGE LEFT / BEGIN 55 4000 FEET (Virginia MM1)
4. $250.00 SPEEDING PENALTY / **SPEED LIMIT 55** (Edge of WZ – Line)

Speed Results

I-95 NB & SB Before Totals	
Total Obs	6045
Speed Limit	70
Average	72.63
50th Percentile	72.30
85th Percentile	76.90
Stnd Dev	4.88
Variance	23.98

I-95 NB & SB Totals Workzone Data	
Total Obs	1957
Speed Limit	55
Average	54.65
50th Percentile	54.07
85th Percentile	58.98
Stnd Dev	5.33
Variance	31.97

I-95 NB & SB After Totals	
Total Obs	4707
Speed Limit	70
Average	72.12
50th Percentile	71.73
85th Percentile	76.50
Stnd Dev	4.84
Variance	23.44

85th Percentile of Before and After nearly the same – expected after increase due to smoother roadway

Average and 50th Percentile of Workzone speed under speed limit means compliance achieved

PACE Speed Calc	
Low Pace	69
High Pace	78
Vehicle %	70.48

PACE Speed Calc	
Low Pace	50
High Pace	59
Vehicle %	73.94

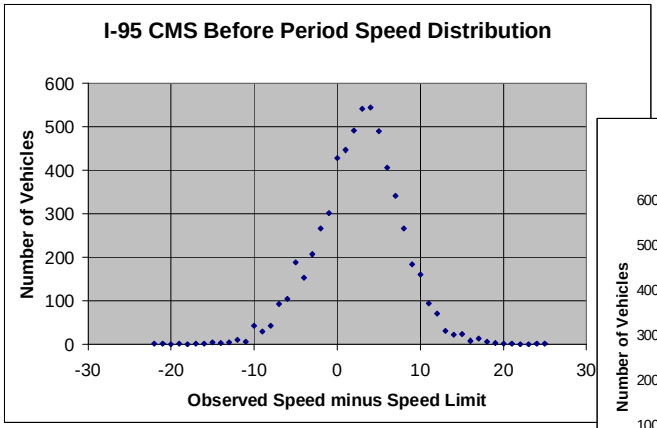
PACE Speed Calc	
Low Pace	68
High Pace	77
Vehicle %	69.98

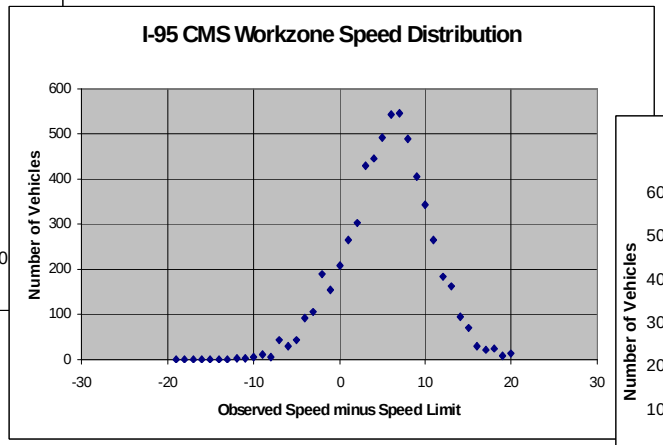
Pace Speeds contain 70% of vehicles = enhanced safety based on commonly accepted engineering practices

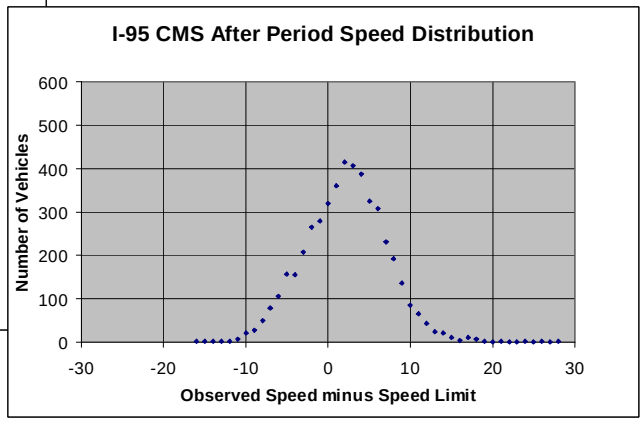
Percentage of Vehicles Exceeding Speed Limit

	Before	During Downstream	During Workzone	During Upstream	After
Speed Limit	70	70	55	65	70
Total Obs	6045	1842	1957	2260	4707
Above Limit	4580	1277	817	1812	3033
% Exceeding	75.77%	69.33%	**41.74%**	80.18%	64.44%

- Highest speed compliance in workzone
- Similar speed distribution, peak from 0 to +10







Progression Analysis

SB During Progression Analysis

	Upstream	Workzone	Downstream
Speed Limit	65	55	70
Total Obs	1524	1226	1042
Average	69.92	55.11	72.9
85th	73.98	59.31	76.78
% Exceeding	82.61%	43.47%	71.11%

SB Progression: A-B-C

% reduced by nearly half coming into the workzone

NB During Progression Analysis

	Downstream	Workzone	Upstream
Speed Limit	70	55	65
Total Obs	800	731	736
Average	72.42	53.71	68.73
85th	76.60	58.34	73.03
% Exceeding	66.75%	38.85%	75.00%

NB Progression: C-B-A

Significant reduction into workzone, reduced % upstream compared to SB analysis

Discussion / Other Factors

•Construction vehicle lead platoons

•Squeezing of traffic onto shoulder

•Crossing rumble strips getting onto and using the shoulder

Conclusions

1. Speed Compliance obtained – successful workzone traffic control
2. 55-mph CMS Posted Speed was **NOT SOLEY RESPONSIBLE** for compliant speed reduction within the workzone
3. Other commonly used workzone techniques to include – construction lead vehicles, “squeezing” of traffic onto shoulder, effective use of pre-existing rumble strips, and significant advance warning of approaching roadwork
4. DOT Workzone Traffic Control and Common Contractors have developed effective measures to keep traffic under control

Jason B. Schronce

NCDOT Traffic Safety
Safety Evaluation

919-773-2967

Comparison Study : Static Speed Study

(*Preliminary Results) I-5013*

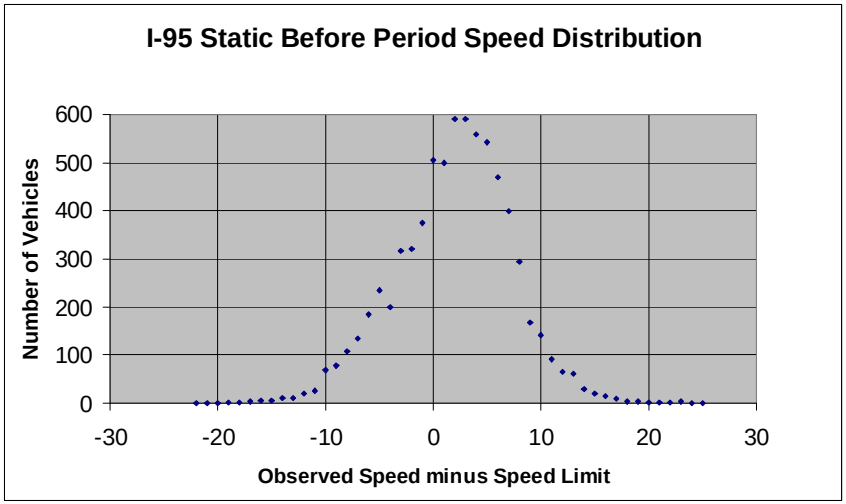
1. Same Study Criteria as CMS Speed Evaluation

   Data Collection Techniques, Amount of Data, Study Parameters
2. Located on I-95 directly south of previous study (MM 160 – 167)
3. Same Roadway Geometry, Speed Limits, Vehicle ADT, Type of Vehicles
4. Same Contractor Performing Resurfacing Work – Barnhill Construction
5. Only Workzone Traffic Control Change: Speed Set on Static Signs, not CMS
6. Workzone Speed Limit Reduction: 70 MPH to 55 MPH

Speed Results - *Preliminary*

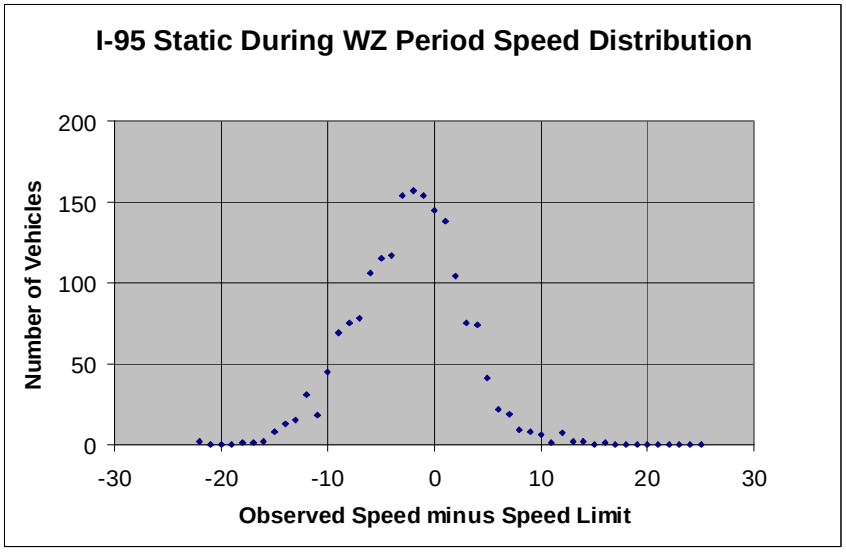
I-95 NB & SB Before Totals	
Total Obs	7173
Average	71.95
50th Percentile	71.86
85th Percentile	76.58
Stnd Dev	5.26
Variance	27.74

PACE Speed Calc	
Low Pace	68
High Pace	77
Vehicle %	67.60



I-95 NB & SB During WZ Totals	
Total Obs	1815
Average	52.41
50th Percentile	52.02
85th Percentile	56.70
Stnd Dev	4.75
Variance	22.65

PACE Speed Calc	
Low Pace	48
High Pace	57
Vehicle %	69.86



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Safety Evaluation Website – Completed Project

http://www.ncdot.org/doh/preconstruct/traffic/safety/ses/projects/completed.html

Other CMS Evaluations: State of Utah (using counters)

www.dot.state.ut.us/main/uconowner.gf?n=12684941153003192 34

QUESTIONS?